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FEATURE

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# MEETING THE ENERGY NEEDS OF RURAL PEOPLE

by ROWAN SHIRKIE

The energy crisis hits hardest at those who have the least energy available to them... rural families in developing countries. For them, it means having to walk further and search harder for firewood and water. It means poorer crops and lower incomes because fertilizers have become scarce and expensive. It means that, more than ever, they are bound to poverty, and that their basic needs go unsatisfied.

Energy is very simply the capacity to work, and it is an historical fact that development -- particularly economic growth -- results largely from the substitution of different energies for muscle power in agricultural, industrial, and domestic processes.

Yet the energy needs of rural people in developing countries, who comprise the majority of the world's population and whose principal occupation is agriculture, get little attention. Pressured to intensify food production to support a rapidly growing -- and increasingly urban -- population, farmers must make the most of existing lands and expand their activities onto more marginal areas. The situation has produced a new agriculture, based on high yielding varieties requiring more intensive cultivation techniques and higher energy inputs. Irrigation replaces adequate natural rainfall; fertilizer, prime land; the draft power of tractors, human and animal muscle. The greatest energy inputs in agriculture are required for the production of chemical fertilizer, followed by irrigation and postharvest processing. Satisfying these energy needs at a reasonable cost should become one of the objectives of any development plan aimed at the small farmer.

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radiation with improved air circulation to securely and efficiently preserve a variety of products; grains, fruits, vegetables, and fish. Crops that must be harvested during rainy seasons can be preserved in driers that use biogas as a heat source.

These techniques are essentially conservation measures: the better matching of energy sources and quality to its ultimate use saves scarce and expensive oil and gas for other uses that might more directly influence productivity. But agriculture may actually form part of a new energy resource. Two renewable, sustainable, sources of energy have their basis in agricultural activities: methane "biogas" generation from the fermentation of organic wastes, and the distillation of alcohol fuels from plant material.

Biogas is manufactured natural gas, the result of bacterial digestion of crop wastes and animal and human excreta under controlled conditions. Biogas digesters consist of a fermentation tank in which dung and various organic wastes are mixed with water and fermented to produce methane. The product is an efficient, clean-burning gas that can be used for cooking, heating, industrial and agricultural processes and equipment.

One of the byproducts of the biogasification process is an organic residue that is an excellent source of plant nutrients and a good soil conditioner. Thus the process produces both fuel and fertilizer. India, which pioneered small-scale biogas technology, introduced thousands of gobar (Hindi for cow dung) plants in rural areas. They met with limited success, due to operating and design features that made the system too expensive for the poor rural farmers it was meant to serve. The Chinese have adopted and adapted the biogas technology, and produced a digester that reduces costs by half and simplifies operation. More than four million of these plants are reported to have been built in China during the past three years, and experiments with the Chinese model in India and Pakistan indicate that the system may enjoy success there as well.

The other alternative source of energy derived from agriculture is the distillation of alcohol fuels from the starches and sugars contained in such crops as cassava and surgarcane. Distillation of alcoholic beverages is of course an ancient and widespread technology. Producing ethanol or

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methanol fuels from plant biomass on a large scale is somewhat more complex, but one developing country, Brazil, has embarked on a plan to replace at least 20 percent of petroleum fuels with biomass alcohol fuels by 1990. Alcohol fuels are presently blended with gasoline and used in conventional engines. Suitably redesigned engines can run exclusively on alcohol. Brazil expects to reap a number of additional benefits from its program, including the creation of up to one million new jobs, primarily in the agricultural sector.

Sunlight, wind, and growing plants have the potential to provide thousands of times more energy that the world presently consumes, and it is the rural areas of developing countries that generally have the largest concentrations of these resources. Extracting that energy, and providing it in useful form when and where it is needed most is crucial to any future development efforts intended to benefit rural families.

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